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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/920,891	08/02/2001	Michael Kwan	A4231/T34410	9729

32588 7590 04/22/2003

APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

EXAMINER

KACKAR, RAM N

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 04/22/2003

12

Please find below and/or attached an Office communication concerning this application or proceeding.

AS 18

**Office Action Summary**

Application No.

09/920,891

Applicant(s)

KWAN ET AL.

Examiner

Ram N Kackar

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 April 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 17-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)                      4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_                      6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al (US patent Number 5990000) in view of Papasouliotis et al (US patent Number 6030881).

Hong et al disclose a computer readable storage medium having a computer readable program embodied therein (See Col 6 line 58-65), for controlling the mixture of gases, chamber pressure, temperature, RF power level, pedestal position and other parameters of a process for deposition of a dielectric layer according to a three-step deposition/etch back/deposition process (See Fig 2A 230-245) so that it covers plurality of raised features and at least partially fills in gaps. (See Col 15 line 30-33).

Hong et al do not disclose that the deposition part of their three-step process could be a simultaneous deposition/Etch process. Consequently they do not disclose a mixture of deposition and inert gas and the ratio of deposition and sputter etch.

Papasouliotis et al disclose a multi step process using a mixture of deposition and an inert gas and teach that the ratio of deposition/etch for the simultaneous deposition and etch in first and third step, should be greater than 1 and preferably between 4 and 50 to ensure net deposition (Abstract and Col 4 line 10-16).

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There fore it would have been obvious to one having ordinary skill in the art at the time invention was made to modify the simple deposition steps (Step 230 and 245 of Fig 2A) of Hong et al's to simultaneous deposition/sputter steps by using a mixture of deposition and inert gas and maintain the ratio of Deposition/Sputter greater than 1 in order to have net deposition over gaps of high aspect ratios and be able to fill the bottom of the gap better before the closure of the gap at the top.

Regarding Claim 17 (c,d) and 20(g(iii-iv) Hong et al disclose a chemical etch step (Step 235 Fig 2A) after the first deposition step.

Hong et al do not explicitly disclose a substrate-cooling step before starting etchant gases.

Papasouliotis et al disclose changing temperature before transition from deposition to etching (Col 8 lines 42-45).

Since the deposition step is typically done at a higher substrate temperature (See Col 4 line 24, Step 210 Fig 2A and Orczyk - US 5937323 Col 1 line 30-34) and etch process is done at a lower temperature, it would have been obvious to one having ordinary skill in the art at the time invention was made to bring substrate to a lower temperature after deposition step and before etch step so as to be able to control the substrate temperature properly at a lower value for etch.

#### ***Response to Amendment***

Applicant's latest arguments filed 4/2/2003 have been considered but found to be non persuasive.

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Applicant argues that in regards to rejection of claims 17 and 20 no *prima facie* case of obviousness has been established since no support from dep/etch/dep art had been provided for the cooling step recited in these claims.

Examiner disagrees. Both Hong and Papasouliotis are related to deposition and etch and concerned with filling of gaps of high aspect ratio. Papasouliotis et al disclose essentially the same solution - simultaneous Deposition and Etch steps using the ratio of dep/etch as a control variable- for the same problem.

Applicant further argues that inherent cooling in Papasouliotis is a misapplication of the doctrine of inherency.

Examiner has nowhere stated that in Papasouliotis cooling step was inherent. The rejection is based upon obviousness. Papasouliotis et al teach that in general, a temperature change will be needed and considering the fact that CVD deposition takes place at a higher temperature and etch process is done at a low temperature it would have been obvious to have a cooling step between the two. The teaching references of Sherstinsky (5316278- Col 1 lines 15-26) and Kholodenko (6310755- Col 1 lines 56-60) were provided to support the position that low temperature was desirable for etching. Examiner's use of "inherent reason" in the response to amendment in the last office action was in a different context.

Applicant further argues that Papasouliotis et al teach a continuous transition and do not teach a separate step.

Examiner disagrees. It is obvious that as temperature can't be changed instantaneously, a separate step before etch process step would be required. Moreover, every transition is a separate instruction and a separate step.

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Applicant further argues that Sherstinsky and Kholodenko reference to cooling is merely to counteract the plasma heat.

Sherstinsky clearly teaches that it is conventional to cool the wafer during plasma etching. It would therefore make sense not only to cool during etch processing, but also cool it to the operating temperature before starting process, especially if the preceding step left the wafer at higher temperature. As discussed above this, would be the typical case (Hong 5990000-Col 4 line 24, Step 210 Fig 2A and Orczyk- 5937323 Col 1 line 30-34). Kholodenko goes even further and clearly teaches the desirability of cooling rapidly before etch to maintain the temperature in a narrow range, implicitly teaching the sensitivity of etch process to temperature.

Applicant's argument in respect of rejections using Wang have persuaded the examiner to remove these rejections.

### *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N Kackar whose telephone number is 703 305 3996. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 703 308 1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9310 for regular communications and 703 872 9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0661.

RK  
April 16, 2003

  
SHRIVE P. BECK  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700